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## Result Page



CLAIMS

1. Apparatus following evaporator claim 1 of the main patent, characterized by the fact that the gas (Gc) used to convey heat throughout the system of exchange is there substantially under a substantially constant pressure, with the pressure losses near.

2. Apparatus following evaporator claim 1, characterized by the fact that the hot source (R) is consisted by any apparatus or together of known apparatuses each one in oneself, capable to ensure on the one hand a transfer of heat gas and the solution and, on the other hand, a separation of liquid and gas and an extraction of the concentrated solution.

3. Apparatus evaporator according to claim 1, characterized by the fact that the cold source (C) is consisted by any apparatus or together of known apparatuses each one in oneself, capable to ensure a transfer of heat and a separation of liquid and gas.

▲ top 4. Apparatus evaporator according to claim 1, characterized by the fact that it is associated a conventional heat pump to carry out a transfer of calories of the cold source to the hot source.

5. Apparatus evaporator according to claim 1, characterized by the fact that the gas (G) used to convey heat is reactive with respect to the milked solution.

6. Apparatus evaporator according to claim 1, characterized by the fact that the gas (G) used to convey heat is neutral with respect to the treated solution
7. Apparatus evaporator according to claim 1, characterized by the fact that the gas used to convey heat is a neutral gas mixture and reactive gas with respect to the treated solution.

8. Apparatus evaporator according to claim 1, characterized by the fact that its pressure can be selected with the optimum value corresponding with the problem.

## Result Page



In the main patent, one described a boiling-in apparatus has multiple isobar- effect, I.e. an apparatus in which the fluid heat-transfer is all along the system with an uniform and substantially constant pressure
One is reminded that a boiling-in apparatus, some is its type, functions between two limits which are the temperature of the hot source, for example the vapor of heating, and the temperature of the cold source, example the condenser
The laws of thermodynamic learn that the output of the boiling-in apparatus (rendemellt=poids in kg of evaporated water per kg of vapor of heating) is of as much good than one can break up the total fall of available temperature into a larger number of fractions.

It is what is applique in the evaporators for multiple purpose or stepped relaxation.

In these two types of installations the degradation of calorific energy is carried out by bearings.

L#-invention, object of the main request, made state of an apparatus evaporator in which the degradation of energy is carried out, on the other hand, of continuous manner thus improving the rendement' of apparatus Such an apparatus associated with an hot source and a fruide source is essentially characterized by the fact that it includes/understands a single exchanger on surface in which the number of stage of fall is unlimited between the hot source and the cold source, the solution to together evaporate y being conveyed with counter-current with a gas towards the hot source, the gas saturates with moisture and after réchauftage in the aforementioned hot source circulating then in the E "" changer to convey there heat and to transfer from the calories to the surface of the exchanger so that the varsation of temperature of the mixture gas-steamer in each point of the exchanger involving the variation of the proportions in volume of gas-steamer and that of the potentials partial 'of transmitted energy, continuously ensures 1 gradient népessaire the heat transfer to the solution to be evaporated, the cold source making it possible to cool evacuated gas of the exchanger and the débarr, asser of its hwnidity and a ventilator reinjecting this gas in the solution to be evaporated with its inlet in the exchanger.

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The gas used to convey heat throughout the system is with a substantially constant pressure, with the pressure losses ready, 5, and it is this feature which justifies designation "for multiple isobar purpose" of 1 ' apparatus.

Other characteristics D, E the invention will arise from the description hereafter of an embodiment of an installation of evaporation according to the main invention, given as example in reference to the annexed drawing whose single figure represents the schematic installation of manner.

The installation includes/understands a single exchanger E, a cold source C, an hot source R and a ventilator V connecting the cold source to the exchanger.

The exchanger E is a conventional exchanger on surface which can be mounted indifferently horizontally or vertically.

The solution supply to be evaporated is done with the inlet
With ité, changer E to which is also connected the extended one of the ventilator V which brings under suitable pressure a gas extracted the cold source C. The solution to be evaporated is thus directed by gas towards the exchanger and is heated there progressively by a recovery of heat described further.

In the exchanger, the liquid solution and the gas stéchauf- fent and the solution vaporizes in consequence of the solvent absorptance by the gas which is saturated with moisture at the same time as it warms up,
To extended of the exchanger E, the mixture gas-liquid is directed towards the hot source R which will comprise essentially a device of reheating of gas and solution and a device of separation of the concentrated solution. This last is extracted by a piping B.

A gas makeup is supplied in G with the inlet of the hot source R to compensate for the possible escapes or losses.

The reheating of the hot source R is carried out here by vapor condensation vive.alimentée out of H; the condensate while rdsultant is extracted in H.

Very other mean of heating which the vapor can be employed without disadvantage.

The gas saturated with moisture turns over to the exchanger E to an upper temperature to that which it had by leaving this exchanger to pass in hot source R.

Economic conditions will make it possible to fix the variation in gas temperature carried out in hot source R.

The hot gas gr. incoming in the exchanger E coming from the hot source R will cool in contact with the heat-transferring surface and will yield to it the heat of vaporization of moisture with which it is charged. It will cool thus more and more along the exchanger, since it will be put in contact of heat-transferring surface progressively increasingly cold because of circulation with counter-current of the solution to heat and gas to be cooled.

With extended of the exchanger E, the cooled wet gas - Gc goes to the cold source C cooled for example by a cold water circulation incoming out of F. The temperature of gas is lowered in the cold souree until a temperature compatible with its recycling by the ventilator V, at the same time as condensed moisture is separated and extracted by a piping D and the cooling water is evacuated in F'.

The cold source is illustrated by a condenser cooled by a water circulation > but very other mean of cooling of gas can be employed without disadvantage.

The description of the embodiment according to the main invention, above, made state of a heater R constituting the hot source and of an exchanger C constituting the cold source.

One also mentions the possibility of bringing heat necessary to the hot source by the vapor (inter alia means) and of eliminating the calories with the cold source, for example by a water circulation.

But the applicant noted, and C T is there 1 T object of the addition, that the installation according to the main invention, could perfectly be associated a conventional heat pump in which the boiling of the fluid heat-transfer would take place in the exchanger of the cold source C and the condensation of the fluid heat-transfer compressed in the exchanger of hot source R.

top

One would carry out a tranfert thus calories of the cold sour this to the hot source of the evaporator.

It is supposed that the solution to be evaporated is an aqueous solution and that it is the water which evaporates.

The incoming gas by the ventilator V to enter the exchanger E can be at a temperature of 500C; it can leave the exchanger E to 700C and the hot source R at 75 C.

The unit can function under a constant pressure of 3 kg/cm2 absolute, as example.

The study of the tensions partial of the steam makes it possible to draw up the following table
EMI4.1

<Tb> <SEP> Pressure <SEP> Partial <SEP> Mol. <SEP> Water <SEP> Poins <SEP> of water <SEP> In <SEP> Kg
<Tb> <SEP> T C
<Tb> <SEP>
<Tb> Water <SEP> Gas <SEP> mol. <SEP> Gas <SEP> mol. <SEP> <SEP> Gas
<Tb> <SEP> 75 <SEP> 0,3928 <SEP> 2,6072 <SEP> <SEP> 0,1506 <SEP> 2,7108
<Tb> 70 <SEP> <SEP> 0,3175 <SEP> 2,6825 <SEP> 0,1183 <SEP> 1 <SEP> <SEP> 2,1294
<Tb> <SEP> 50 <SEP> 0,1258 <SEP> 2,8742 <SEP> - 0,0437 <SEP> <SEP> - <SEP> 0,7866
<Tb>
One concludes from it that the total quantity of evaporated water is 2,7108 - 0,7866 = 1,9242 kg, whereas the quantity of evaporated water to the hot source is 2,7108 - 2,1294 = 0,5814 kg is 0,5814 = 30,2% of evaporation
1,9242 total.

That comes down to saying, if the hot source is heated by the vapor, that the vapor consumption of heating will be only about 30% of the total evaporation of the installation.

The energy saving thus carried out is obvious and corresponds substantially to that which would have been carried out in a traditional evaporator for 5 purposes.

On the planar one of the realization, such an apparatus can make call with any known technology.

The hot source can be carried out by a conventional evaporator or any apparatus or together of apparatuses capable to ensure a transfer of heat and a recovery of liquid and gas.
In the same way, the cold source can be carried out by a conventional exchanger or an evaporator or any apparatus or together of apparatuses capable to ensure a transfer of heat and a separation of liquid and gas.

The ventilator V which has other role only to overcome the pressure losses of the circuit, can be of any conventional type.

The gas used for the transport of heat can be a neutral gas with respect to the liquid treaty or, on the contrary, a reactive gas screw-à-screw of the solution, if one wishes to simultaneously carry out a reaction and an evaporation.

It can be also a neutral gas mixture and reactive gas if one wants to control the reaction.

▲ top